

INTERNATIONAL STANDARD

IEC
60191-6

1990

AMENDMENT 1
1999-12

Amendment 1

Mechanical standardization of semiconductor devices –

Part 6: General rules for the preparation of outline drawings of surface mounted semiconductor device packages

Amendement 1

Normalisation mécanique des dispositifs à semiconducteurs –

Partie 6: Règles générales pour la préparation des dessins d'encombrement des dispositifs à semiconducteurs à montage en surface

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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FOREWORD

This amendment has been prepared by subcommittee 47D: Mechanical standardization of semiconductor devices, of IEC technical committee 47: Semiconductor devices.

The text of this amendment is based on the following documents:

FDIS	Report on voting
47D/320/FDIS	47D/327/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

A bilingual version of this amendment may be issued at a later date.

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After subclause 4.4, add the following subclauses 4.5 and 4.6:

4.5 TSOP Type1

See annex A.5.

4.6 TSOP Type2

See annex A.6.

After subclause 5.1, add the following subclauses 5.2 and 5.3

5.2 TSOP Type1

See annex B.2.

5.3 TSOP Type2

See annex B.3.

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Add, after Appendix A4, the following annexes A.5 and A.6.

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Withdrawn

Annex A.5 – Drawing of TSOP Type1

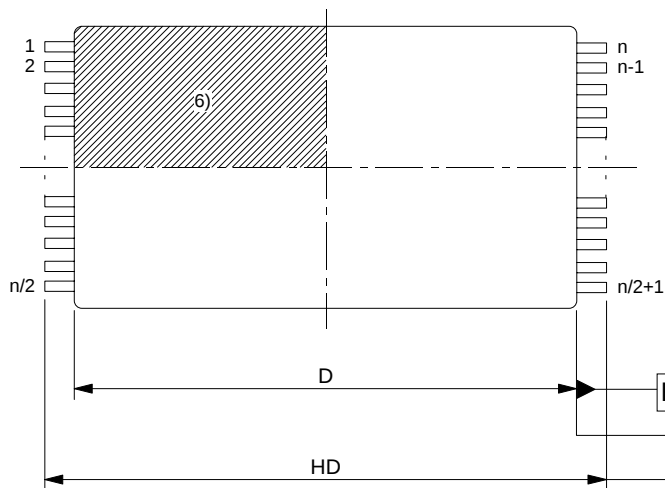


Figure 1a

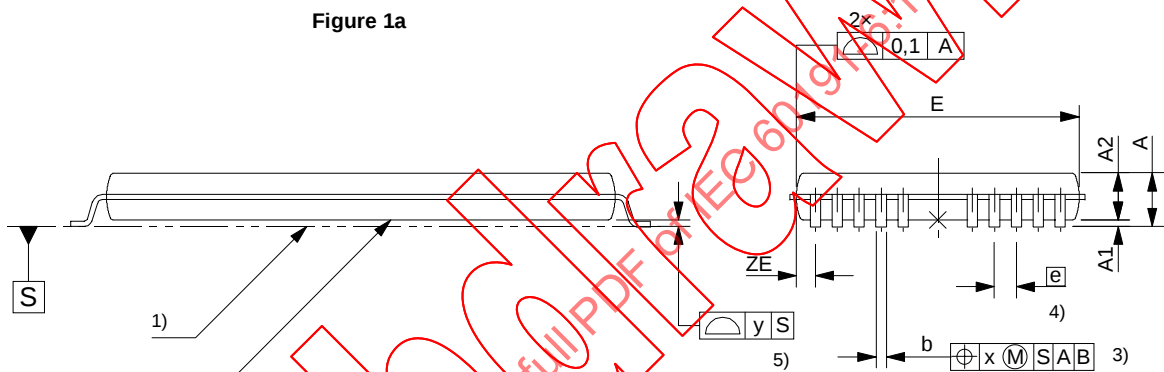


Figure 1b

Figure 1c

Definition of datum A

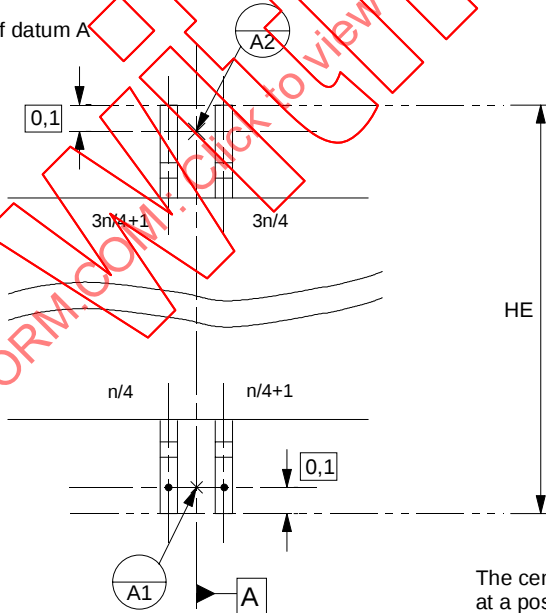
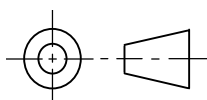


Figure 2

The center of facing side of adjacent leads
at a position 0,1 mm inside top of the leads.

IEC 1840/99



Date: 1999

Annex A.5 – Drawing of TSOP Type1

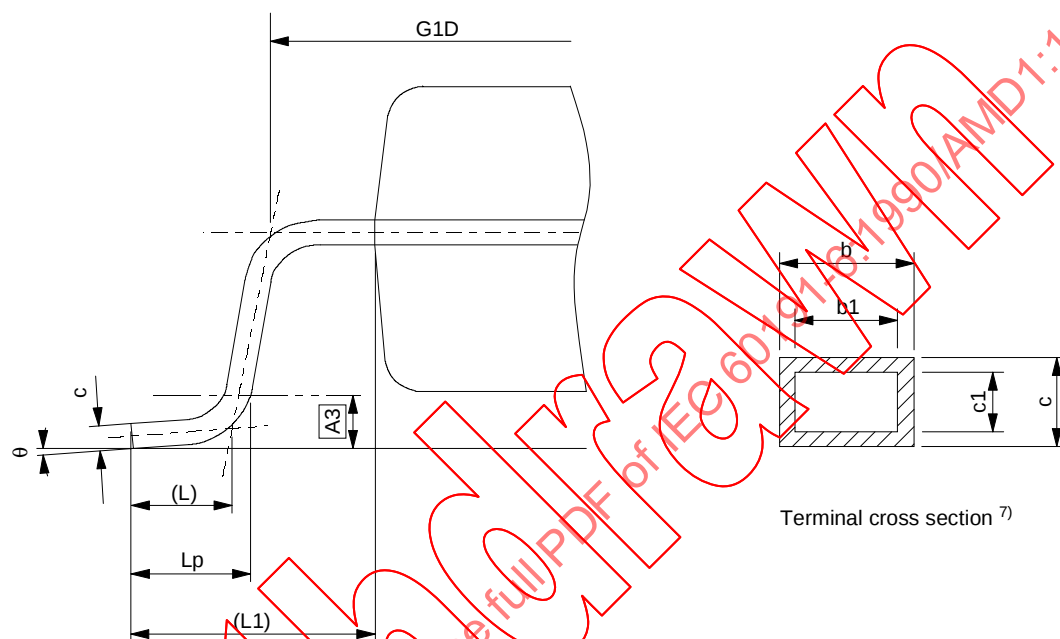
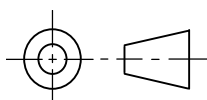
Terminal cross section ⁷⁾

Figure 3

IEC 1841/99

NOTES

- 1) Seating plane.
- 2) Base plane.
- 3) The maximum material conditions apply to the positional tolerance of the terminals.
- 4) Specifies the true geometric position of the terminal axis.
- 5) Coplanarity. Specifies the allowable vertical distance of the lowest part of each terminal from the seating plane.
- 6) Index area. Shows the allowable position of the index mark, which shall be included in the shaded area entirely.
- 7) The dimensions of the terminal cross section apply to the ranges of 0,1 mm and 0,25 mm from the end of a terminal.



Date: 1999

Annex A.5 – Drawing of TSOP Type1

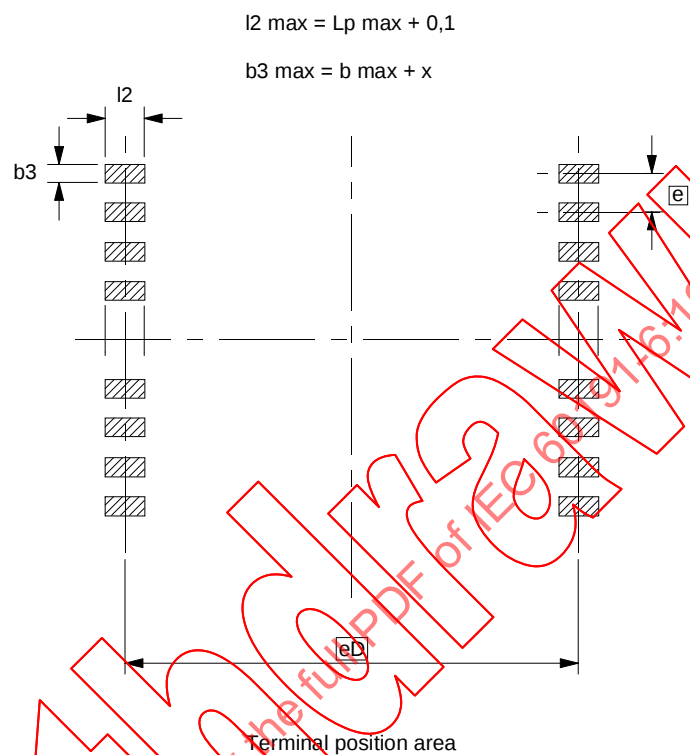
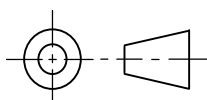


Figure 4

IEC 1842/99



Date: 1999

Annex A.6 – Drawing of TSOP Type2

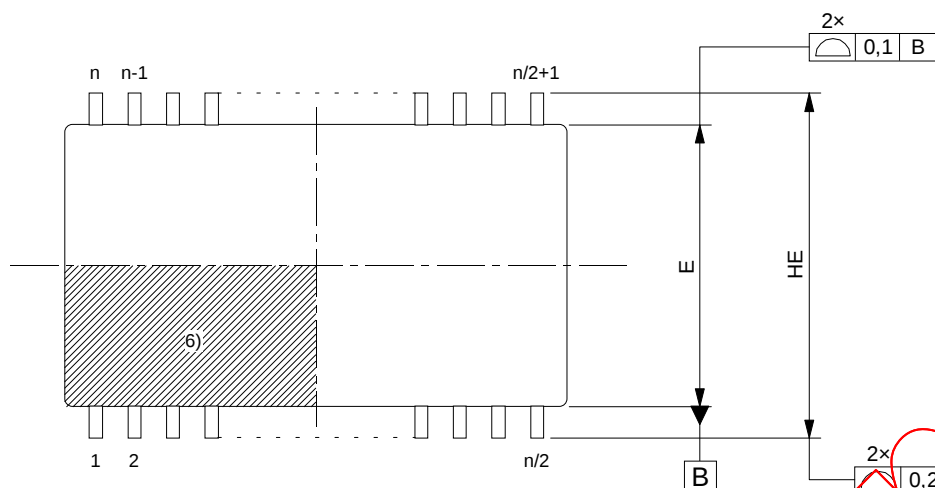


Figure 1a

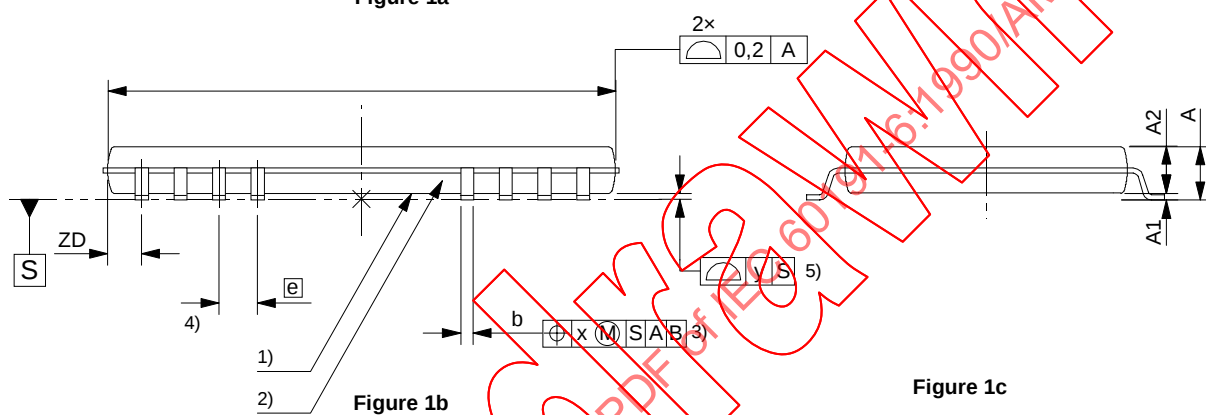


Figure 1b

Figure 1c

Definition of datum A

1) For even number of leads on package side.

2) For odd number of leads on package side.

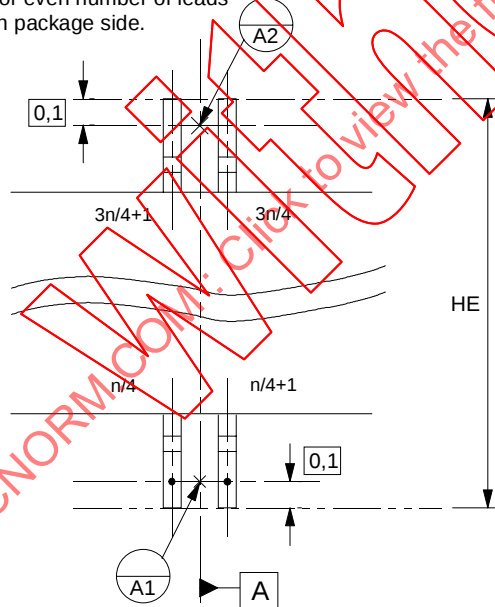


Figure 2a

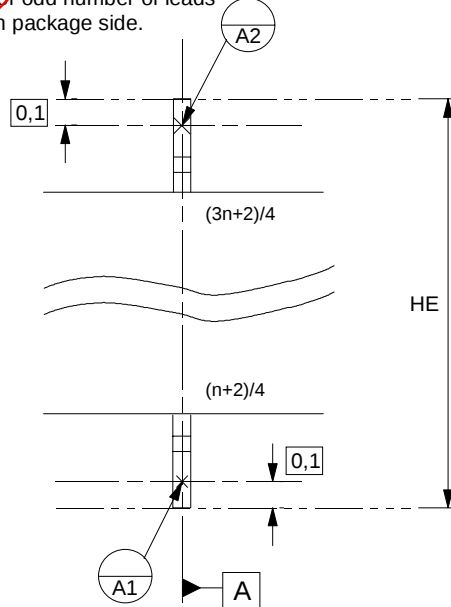
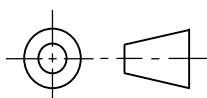
The center of facing side of adjacent leads at a position $0,1$ mm inside top of the leads.

Figure 2b

The center leads at a position $0,1$ mm inside top of the leads.

IEC 1843/99



Date: 1999

Annex A.6 – Drawing of TSOP Type2

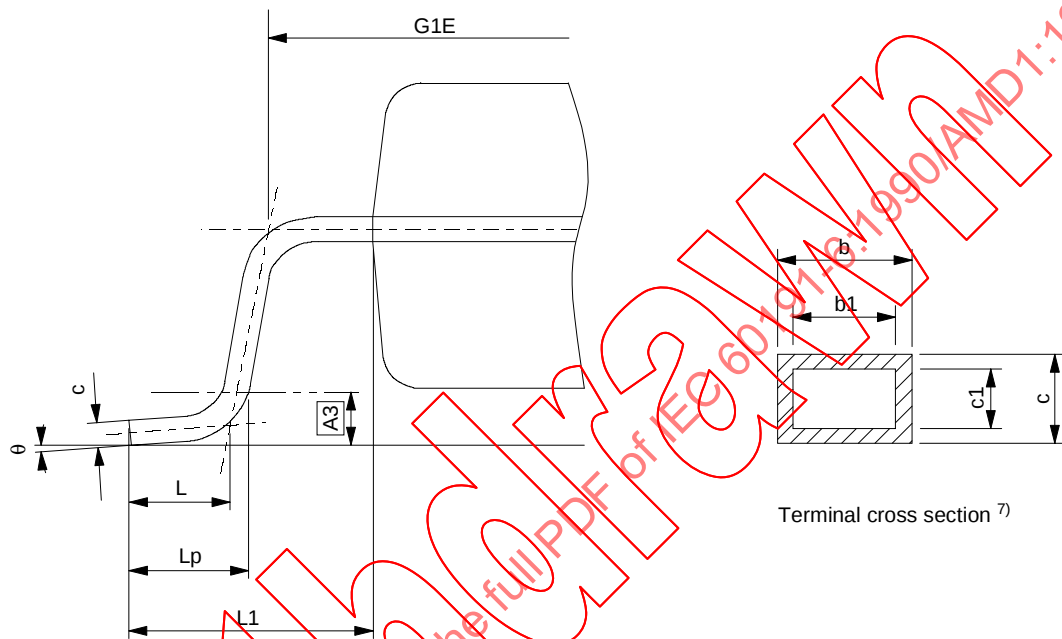
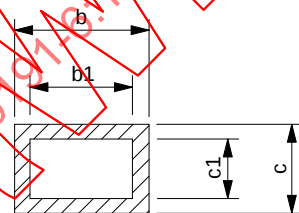


Figure 3a



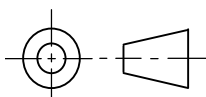
Terminal cross section ⁷⁾

Figure 3b

IEC 1844/99

NOTES

- 1) Seating plane.
- 2) Base plane.
- 3) The maximum material conditions apply to the positional tolerance of the terminals.
- 4) Specifies the true geometric position of the terminal axis.
- 5) Coplanarity. Specifies the allowable vertical distance of the lowest part of each terminal from the seating plane.
- 6) Index area. Shows the allowable position of the index mark, which shall be included in the shaded area entirely.
- 7) The dimensions of the terminal cross section apply to the ranges of 0,1 mm and 0,25 mm from the end of a terminal.



Date: 1999

Annex A.6 – Drawing of TSOP Type2

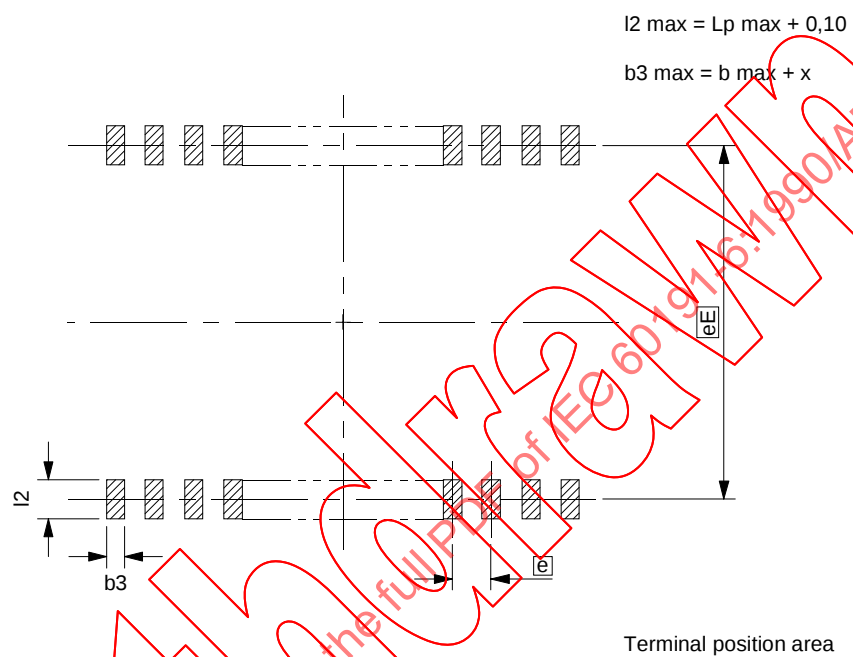
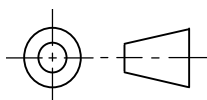


Figure 4

IEC 1845/99



Date: 1999

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Add, after Appendix B1, the following annex B.2.

Annex B.2

Recommended values for TSOP Type1, original dimensions: mm.

These recommendations apply to the packages illustrated by annex A.5 and to similar packages.

Packages of this family are classified into types based on dimension E x HD.

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Withd2AM

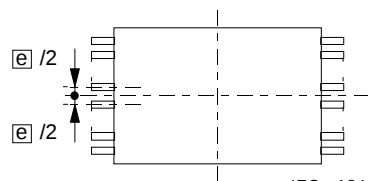
Group 1 – Dimensions appropriate to mounting and interchangeability

Description	Symbol	Standard	Recommended values	Remarks												
Nominal dimensions	E × HD	6 × 14 8 × 14 14 × 20 6 × 16 8 × 16 6 × 18 8 × 18 6 × 20 8 × 20 10 × 14 12 × 14 10 × 16 12 × 16 18 × 18 12 × 18 10 × 20 12 × 20	—													
Package width	E	E = 6 + 2k k = 0,1,2,3,4 <table><tr><th>k</th><th>E</th></tr><tr><td>0</td><td>6,00</td></tr><tr><td>1</td><td>8,00</td></tr><tr><td>2</td><td>10,00</td></tr><tr><td>3</td><td>12,00</td></tr><tr><td>4</td><td>14,00</td></tr></table>	k	E	0	6,00	1	8,00	2	10,00	3	12,00	4	14,00	—	1) Dimension E does not include resin fines and gate remainders 2) It is recommended that upper and lower cavities be equal 3) Mold protrusion is less than 0,20 mm
k	E															
0	6,00															
1	8,00															
2	10,00															
3	12,00															
4	14,00															
Package length	D	D = HD - 2L1 nom	—	1) Dimension D does not include resin fines and gate remainders 2) It is recommended that upper and lower cavities be equal. If they are different, the larger dimension shall be regarded												
Package height	A2	<table><tr><th>Min</th><th>Nom</th><th>Max</th></tr><tr><td>0,95</td><td>1,00</td><td>1,05</td></tr></table>	Min	Nom	Max	0,95	1,00	1,05	—	1) Bend of package is included						
Min	Nom	Max														
0,95	1,00	1,05														
Overall width	HD	HD = 14 + 2 h h = 0,1,2,3 <table><tr><th>h</th><th>HD</th></tr><tr><td>0</td><td>14,00</td></tr><tr><td>1</td><td>16,00</td></tr><tr><td>2</td><td>18,00</td></tr><tr><td>3</td><td>20,00</td></tr></table>	h	HD	0	14,00	1	16,00	2	18,00	3	20,00	—			
h	HD															
0	14,00															
1	16,00															
2	18,00															
3	20,00															
Seated height	A	<table><tr><th>Min</th><th>Nom</th><th>Max</th></tr><tr><td></td><td></td><td>1,20</td></tr></table>	Min	Nom	Max			1,20	—	1) Bend of package is included						
Min	Nom	Max														
		1,20														

Group 1 (continued)

Description	Symbol	Standard	Recommended values	Remarks																																								
Stand-off height	A1	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,05</td><td>0,10</td><td>0,15</td></tr></table>	Min	Nom	Max	0,05	0,10	0,15	—																																			
Min	Nom	Max																																										
0,05	0,10	0,15																																										
Standard height of soldered points	A3	A3 = 0,25	—																																									
Length of soldered part	Lp	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,45</td><td>0,60</td><td>0,75</td></tr></table>	Min	Nom	Max	0,45	0,60	0,75	—																																			
Min	Nom	Max																																										
0,45	0,60	0,75																																										
Terminal width	b	<table><tr><td>e</td><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,65</td><td>0,17</td><td></td><td>0,32</td></tr><tr><td>0,50</td><td>0,17</td><td></td><td>0,27</td></tr><tr><td>0,40</td><td>0,13</td><td></td><td>0,23</td></tr><tr><td>0,30</td><td>0,09</td><td></td><td>0,175</td></tr></table>	e	Min	Nom	Max	0,65	0,17		0,32	0,50	0,17		0,27	0,40	0,13		0,23	0,30	0,09		0,175	<table><tr><td>e</td><td>b nom</td><td>Pb/Sn Solder plating</td><td>Pd plating</td></tr><tr><td>0,65</td><td>0,24</td><td>0,22</td><td></td></tr><tr><td>0,50</td><td>0,22</td><td>0,20</td><td></td></tr><tr><td>0,40</td><td>0,18</td><td>0,16</td><td></td></tr><tr><td>0,30</td><td>0,14</td><td>0,12</td><td></td></tr></table>	e	b nom	Pb/Sn Solder plating	Pd plating	0,65	0,24	0,22		0,50	0,22	0,20		0,40	0,18	0,16		0,30	0,14	0,12		1) b1 denotes the material width of a lead frame 2) b denotes the width of a plated terminal 3) b1 and b apply to the ranges of 0,1 and 0,25 from the end of a terminal 4) Values b apply to Pb/Sn solder plated terminal The standard thickness of the solder layer shall be 0,010^{+0,010}_{-0,005} 5) As Pd plating is very thin, terminal width is defined by b1 = b
	e	Min	Nom	Max																																								
0,65	0,17		0,32																																									
0,50	0,17		0,27																																									
0,40	0,13		0,23																																									
0,30	0,09		0,175																																									
e	b nom	Pb/Sn Solder plating	Pd plating																																									
0,65	0,24	0,22																																										
0,50	0,22	0,20																																										
0,40	0,18	0,16																																										
0,30	0,14	0,12																																										
	b1	<table><tr><td>e</td><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,65</td><td>0,17</td><td>0,22</td><td>0,27</td></tr><tr><td>0,50</td><td>0,17</td><td>0,20</td><td>0,23</td></tr><tr><td>0,40</td><td>0,13</td><td>0,16</td><td>0,19</td></tr><tr><td>0,30</td><td>0,09</td><td>0,12</td><td>0,15</td></tr></table>	e	Min	Nom	Max	0,65	0,17	0,22	0,27	0,50	0,17	0,20	0,23	0,40	0,13	0,16	0,19	0,30	0,09	0,12	0,15	—																					
e	Min	Nom	Max																																									
0,65	0,17	0,22	0,27																																									
0,50	0,17	0,20	0,23																																									
0,40	0,13	0,16	0,19																																									
0,30	0,09	0,12	0,15																																									
Terminal thickness	c	<table><tr><td>e</td><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,65</td><td>0,09</td><td></td><td>0,20</td></tr><tr><td>0,50</td><td>0,09</td><td></td><td>0,20</td></tr><tr><td>0,40</td><td>0,09</td><td></td><td>0,20</td></tr><tr><td>0,30</td><td>0,09</td><td></td><td>0,20</td></tr></table>	e	Min	Nom	Max	0,65	0,09		0,20	0,50	0,09		0,20	0,40	0,09		0,20	0,30	0,09		0,20	1) Pb/Sn Solder plating c nom = 0,170 0,145 0,120 2) Pd plating c nom = c1 nom	1) c1 denotes the material width of a lead frame 2) c denotes the width of a plated terminal 3) c1 and c apply to the ranges of 0,1 and 0,25 from the end of a terminal 4) Values c apply to Pb/Sn solder plated terminal The standard thickness of the solder layer shall be 0,010^{+0,010}_{-0,005} 5) As Pd plating is very thin, terminal width is defined by c1 = c																				
	e	Min	Nom	Max																																								
0,65	0,09		0,20																																									
0,50	0,09		0,20																																									
0,40	0,09		0,20																																									
0,30	0,09		0,20																																									
	c1	<table><tr><td>e</td><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,65</td><td>0,09</td><td></td><td>0,16</td></tr><tr><td>0,50</td><td>0,09</td><td></td><td>0,16</td></tr><tr><td>0,40</td><td>0,09</td><td></td><td>0,16</td></tr><tr><td>0,30</td><td>0,09</td><td></td><td>0,16</td></tr></table>	e	Min	Nom	Max	0,65	0,09		0,16	0,50	0,09		0,16	0,40	0,09		0,16	0,30	0,09		0,16	c1 nom = 0,15 0,125 0,10																					
e	Min	Nom	Max																																									
0,65	0,09		0,16																																									
0,50	0,09		0,16																																									
0,40	0,09		0,16																																									
0,30	0,09		0,16																																									

Group 1 (continued)

Description	Symbol	Standard	Recommended values	Remarks																																		
Angle of terminal flat portions	θ	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0°</td><td>3°</td><td>8°</td></tr></table>	Min	Nom	Max	0°	3°	8°	—																													
Min	Nom	Max																																				
0°	3°	8°																																				
Terminal pitch	e	$e = 0,65$ 0,50 0,40 0,30	—																																			
Tolerance of terminal center position	x	<table><tr><td>e</td><td>x</td></tr><tr><td>0,65</td><td>0,13</td></tr><tr><td>0,50</td><td>0,10</td></tr><tr><td>0,40</td><td>0,07</td></tr><tr><td>0,30</td><td>0,065</td></tr></table>	e	x	0,65	0,13	0,50	0,10	0,40	0,07	0,30	0,065	—																									
e	x																																					
0,65	0,13																																					
0,50	0,10																																					
0,40	0,07																																					
0,30	0,065																																					
Coplanarity	y	<table><tr><td>e</td><td>y</td></tr><tr><td>0,65</td><td>0,10</td></tr><tr><td>0,50</td><td>0,10</td></tr><tr><td>0,40</td><td>0,08</td></tr><tr><td>0,30</td><td>0,05</td></tr></table>	e	y	0,65	0,10	0,50	0,10	0,40	0,08	0,30	0,05	—																									
e	y																																					
0,65	0,10																																					
0,50	0,10																																					
0,40	0,08																																					
0,30	0,05																																					
Standard number of terminal	n	<table><tr><th rowspan="2">E</th><th colspan="4">Terminal pitch</th></tr><tr><th>0,65</th><th>0,50</th><th>0,40</th><th>0,30</th></tr><tr><td>6,00</td><td>16</td><td>24</td><td>28</td><td>36</td></tr><tr><td>8,00</td><td>24</td><td>32</td><td>40</td><td>52</td></tr><tr><td>10,00</td><td>28</td><td>40</td><td>48</td><td>64</td></tr><tr><td>12,00</td><td>36</td><td>48</td><td>60</td><td>76</td></tr><tr><td>14,00</td><td>40</td><td>56</td><td>68</td><td>88</td></tr></table>	E	Terminal pitch				0,65	0,50	0,40	0,30	6,00	16	24	28	36	8,00	24	32	40	52	10,00	28	40	48	64	12,00	36	48	60	76	14,00	40	56	68	88	—	
E	Terminal pitch																																					
	0,65	0,50	0,40	0,30																																		
6,00	16	24	28	36																																		
8,00	24	32	40	52																																		
10,00	28	40	48	64																																		
12,00	36	48	60	76																																		
14,00	40	56	68	88																																		
Terminal layout		Terminal shall be arranged shown below  IEC 1846/99	—																																			

Group 2 – Dimensions appropriate to mounting and gauging

Description	Symbol	Standard	Recommended values	Remarks						
Width between first bent part of terminal	G1D	<table><tr><td>L1 nom</td><td>G1D nom</td></tr><tr><td>0,80</td><td>D + 0,4</td></tr></table>	L1 nom	G1D nom	0,80	D + 0,4	—	1) Used for designing a test socket, tray, etc.		
L1 nom	G1D nom									
0,80	D + 0,4									
Package overhang	ZE	$ZE = (E - (n/2 - 1) \times \boxed{e})/2$	—	1) Resin burrs or residual gates are not included						
Length of flat part of terminal	L	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td></td><td>0,50</td><td></td></tr></table>	Min	Nom	Max		0,50		—	
Min	Nom	Max								
	0,50									
Terminal length	L1	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td></td><td>0,80</td><td></td></tr></table>	Min	Nom	Max		0,80		—	
Min	Nom	Max								
	0,80									

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Add, after Appendix B2, the following annex B.3.

Annex B.3

Recommended values for TSOP Type2, original dimensions: mm.

These recommendations apply to the packages illustrated by annex A.6 and to similar packages.

Packages of this family are classified into types based on dimension E.

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Withd2AM

Group 1 – Dimensions appropriate to mounting and interchangeability

Description	Symbol	Standard	Recommended values	Remarks								
Nominal dimensions	E	a) Soft metric E nom = 1,27 mm (50 mil) × k k = 6,7,8 E nom = 7,62 mm (300 mil) 8,89 mm (350 mil) 10,16 mm (400 mil) b) Hard metric E nom = 11,5 + 1,5 h h = 0,1,2,3 E nom = 0115 (11,50 mm) 0130 (13,00 mm) 0145 (14,50 mm) 0160 (16,00 mm)		Less than 10,16 mm (400 mil) are applied Soft metric package More than 11,50 mm are applied Hard metric package								
Package width	E	<table><tr><th>E</th></tr><tr><td>7,62</td></tr><tr><td>8,89</td></tr><tr><td>10,16</td></tr><tr><td>11,50</td></tr><tr><td>13,00</td></tr><tr><td>14,50</td></tr><tr><td>16,00</td></tr></table>	E	7,62	8,89	10,16	11,50	13,00	14,50	16,00		1) Mismatch of the upper and lower dies and resin burrs are not included 2) It is recommended that upper and lower cavities be equal. If they are different, the larger dimension shall be regarded
E												
7,62												
8,89												
10,16												
11,50												
13,00												
14,50												
16,00												
Package length	D	a) Soft metric D = {(N/2-1) × [e]} + 2ZD nom [e] = 1,27 mm ZD nom = 0,95 mm b) Hard metric D = {(N/2-1) × [e]} + 2ZD nom [e] = 1,25 mm ZD nom = 1,00 mm		1) Mismatch of the upper and lower dies and resin burrs are not included 2) It is recommended that upper and lower cavities be equal 3) Mold protrusion is less than 0,20 mm								
Package height	A2	<table><tr><th>Min</th><th>Nom</th><th>Max</th></tr><tr><td>0,95</td><td>1,00</td><td>1,05</td></tr></table>	Min	Nom	Max	0,95	1,00	1,05	—	1) Bend of package is included		
Min	Nom	Max										
0,95	1,00	1,05										
Overall width	HE	HE = E + 2L1 nom a) Inch based package L1 nom = 0,80 b) Metric package L1 nom = 1,00	—									

Group 1 (continued)

Description	Symbol	Standard	Recommended values	Remarks																																																			
Seated height	A	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td></td><td></td><td>1,20</td></tr></table>	Min	Nom	Max			1,20	—	1) Bend of package is included																																													
Min	Nom	Max																																																					
		1,20																																																					
Stand-off height	A1	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,05</td><td>0,10</td><td>0,15</td></tr></table>	Min	Nom	Max	0,05	0,10	0,15	—																																														
Min	Nom	Max																																																					
0,05	0,10	0,15																																																					
Standard height of soldered points	A3	A3 = 0,25	—																																																				
Length of soldered part	Lp	<table><tr><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>0,45</td><td>0,60</td><td>0,75</td></tr></table>	Min	Nom	Max	0,45	0,60	0,75																																															
Min	Nom	Max																																																					
0,45	0,60	0,75																																																					
Terminal width	b	<table><tr><td>e</td><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>1,27</td><td>0,35</td><td></td><td>0,50</td></tr><tr><td>1,25</td><td>0,35</td><td></td><td>0,50</td></tr><tr><td>1,00</td><td>0,35</td><td></td><td>0,50</td></tr><tr><td>0,80</td><td>0,25</td><td></td><td>0,40</td></tr><tr><td>0,65</td><td>0,17</td><td></td><td>0,32</td></tr><tr><td>0,50</td><td>0,17</td><td></td><td>0,30</td></tr></table>	e	Min	Nom	Max	1,27	0,35		0,50	1,25	0,35		0,50	1,00	0,35		0,50	0,80	0,25		0,40	0,65	0,17		0,32	0,50	0,17		0,30	<table><tr><td rowspan="2">e</td><td colspan="2">b nom</td></tr><tr><td>Pb/Sn Solder plating</td><td>Pd plating</td></tr><tr><td>1,27</td><td>0,42</td><td>0,40</td></tr><tr><td>1,25</td><td>0,42</td><td>0,40</td></tr><tr><td>1,00</td><td>0,42</td><td>0,40</td></tr><tr><td>0,80</td><td>0,32</td><td>0,30</td></tr><tr><td>0,65</td><td>0,24</td><td>0,22</td></tr><tr><td>0,50</td><td>0,22</td><td>0,20</td></tr></table>	e	b nom		Pb/Sn Solder plating	Pd plating	1,27	0,42	0,40	1,25	0,42	0,40	1,00	0,42	0,40	0,80	0,32	0,30	0,65	0,24	0,22	0,50	0,22	0,20	1) b1 denotes the material width of a lead frame 2) b denotes the width of a plated terminal 3) b1 and b apply to the ranges of 0,1 and 0,25 from the end of a terminal 4) Values b apply to Pb/Sn solder plated terminal The standard thickness of the solder layer shall be $0,010^{+0,010}_{-0,005}$
	e	Min	Nom	Max																																																			
1,27	0,35		0,50																																																				
1,25	0,35		0,50																																																				
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	b1	<table><tr><td>e</td><td>Min</td><td>Nom</td><td>Max</td></tr><tr><td>1,27</td><td>0,35</td><td>0,40</td><td>0,45</td></tr><tr><td>1,25</td><td>0,35</td><td>0,40</td><td>0,45</td></tr><tr><td>1,00</td><td>0,35</td><td>0,40</td><td>0,45</td></tr><tr><td>0,80</td><td>0,25</td><td>0,30</td><td>0,35</td></tr><tr><td>0,65</td><td>0,17</td><td>0,22</td><td>0,27</td></tr><tr><td>0,50</td><td>0,17</td><td>0,20</td><td>0,23</td></tr></table>	e	Min	Nom	Max	1,27	0,35	0,40	0,45	1,25	0,35	0,40	0,45	1,00	0,35	0,40	0,45	0,80	0,25	0,30	0,35	0,65	0,17	0,22	0,27	0,50	0,17	0,20	0,23	—	5) As Pd plating is very thin, terminal width is defined by b1 = b																							
e	Min	Nom	Max																																																				
1,27	0,35	0,40	0,45																																																				
1,25	0,35	0,40	0,45																																																				
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